DEVICE FOR PROTECTING AN INJECTION APPARATUS

The present invention relates to a protective device for protecting apparatuses for injecting a product, particularly for medical use, such a syringes.

In the description which follows the terms "proximal" and "distal" are considered with respect to the direction in which the product is injected.

Product injection apparatuses such as syringes are well known. Prefilled syringes are usually filled with a drug before being distributed to the end-user.

However, the end-user is constantly exposed to the risks of needle-stick injuries which are liable to occur after injection.

In order to minimize these risks, it is known practice for syringes to be equipped with a protective device in the form of a sleeve that slides with respect to the syringe and is supposed to cover the needle after injection.

Some of these devices need to be fitted manually by the end-user and are therefore rather unreliable. Other protective devices are activated by a spring upon the action of the end-user. In this case also, the triggering of the protective device depends on an action on the part of the end-user and is therefore haphazard.

To overcome these disadvantages there are protective devices that are activated automatically by a spring at the end of injection. One of the problems encountered with these devices is the risk of activating them prematurely or inadvertently, particularly while they are being manufactured and/or assembled with syringes.

There is therefore a need for a device for protecting a syringe that can be activated automatically but only at the end of injection or only when the end-user so decides.

The objective of the invention is therefore to provide a device for protecting an injection apparatus, particularly a syringe, activated automatically at the end of injection but unable to be activated inadvertently, thus ensuring perfect safety against the risk of needle-stick injuries.

The present invention relates to a device for protecting an injection apparatus for injecting a product, particularly a syringe, the said apparatus comprising a reservoir fitted with a needle at its distal end and a piston connected to an actuating rod surmounted by a piston head, the said device comprising:

- a support sleeve comprising a body able to accommodate the injection apparatus and a proximal end part,
- a protective sleeve able to slide with respect to the support sleeve between a retracted standby configuration in which the needle is exposed and a deployed protective configuration in which it covers the needle,
- the said device being characterized in that it comprises:
- first retaining means for holding the protective sleeve in its standby configuration in a first position, known as the injection position,
- second retaining means for holding the protective sleeve in its standby configuration in a second position, known as the end-of-injection position, which is appreciably offset in the distal direction with respect to the support sleeve,
- an intermediate collar situated in the proximal end part of the support sleeve, able to slide with

respect to this support sleeve within the said proximal end part, the said collar comprising means of collaboration with the piston head of the injection apparatus, and means of deactivating the said first and second retaining means,

- the said first retaining means being able to be deactivated by the said deactivation means of the said intermediate collar by pressure of the piston head in the distal direction on the said means of collaboration of the said intermediate collar so as to cause the protective sleeve to slide in its retracted standby configuration between the said first injection position and the said second end-of-injection position,

- and the said second retaining means being able to be deactivated by the deactivation means of the said intermediate collar by release of the pressure of the piston head on the said collaboration means of the said intermediate collar so as to allow the protective sleeve to deploy under the action of pushing means.

Advantageously, the means of collaboration of the intermediate collar with the piston head comprise two diametrically opposed legs running in the proximal direction, slightly offset from the body of the collar in the radial direction and connected to the proximal end of the collar by radial bridges.

Advantageously, the first retaining means comprise two diametrically opposed longitudinal bulges formed on the internal surface of the wall of the body of the support sleeve, each bulge at its proximal end comprising an internal retaining ramp and two first tabs running axially in the proximal direction from the proximal end of the protective sleeve, each of the said first tabs being provided at its proximal end with a projection the distal face of which is inclined and able to rest on the internal ramp of the proximal end of one said bulge. Thus, the collaboration of the internal ramp of each bulge and of the distal surface of the projection

of the first tab facing the bulge holds the protective sleeve in its first, injection, position in its retracted standby configuration.

Advantageously, the second retaining means comprise a transverse retaining surface situated at the proximal end of each bulge facing the internal ramp of the said bulge and two second tabs running in the proximal direction from the proximal end of the protective sleeve along an axis slightly inclined with respect to the longitudinal axis of the injection apparatus, each second tab being situated facing one said first tab, each second tab being equipped at its proximal end with a hooked portion the proximal face of which is able to rest against the transverse retaining surface of the bulge facing it. Thus, the collaboration of the transverse surface of the proximal end of the bulge and of the proximal surface of the hooked portion of the second tab holds the protective sleeve in its second, end-of-injection, position in its retracted standby configuration.

Advantageously, the deactivation means for deactivating the first and second retaining means are in the form of a surface projecting radially from the body of the collar, the said surface being able to collaborate with the said first tabs and with the said second tabs to deflect them circumferentially.

Advantageously, the pushing means are in the form of a spring the proximal end of which bears against the distal end of the intermediate collar and the distal end of which bears against an annular rim formed on the internal surface of the protective sleeve at its proximal end.

The attached figures illustrate, by way of example, one preferred embodiment of the device according to the invention.

Figure 1 is perspective view thereof;

Figure 2 is a perspective view thereof with the syringe assembled;

Figure 3 is an exploded perspective view showing the elements of the device according to the invention;

Figures 4 and 5 are side views of the device according to the invention in its retracted standby configuration in its first, injection, position, before and after assembly of the syringe, respectively;

Figure 6 is a side view of the device of the invention while the first retaining means are in the process of being deactivated;

Figure 7 is a side view of the device according to the invention in its retracted standby configuration in its second, end-of-injection, position;

Figure 8 is a side view of the device according to the invention while the second retaining means are in the process of being deactivated;

Figure 9 is a side view of the device according to the invention in its deployed protective configuration.

Figures 1 to 3 depict a device 1 for protecting an injection apparatus. This device 1 comprises a support sleeve 2 comprising a body 3 able to accommodate an injection apparatus 4 such as the syringe shown in figure 2 comprising a reservoir 32, a rod 33 for actuating a piston, a piston head 19 and a cap 34 covering a needle (see Figure 6). The support sleeve 2 also comprises a proximal end part 5. The device 1 also comprises a protective sleeve 6. This protective sleeve 6 is able to slide with respect to the support sleeve 2

between a retracted standby configuration in which the needle 7 of the injection apparatus 4 is exposed, as shown in Figure 6, and a deployed protective configuration in which the protective sleeve 6 covers the said needle 7 as shown in Figure 9.

As shown in Figures 1 and 2, the device 1 comprises first retaining means for holding the protective sleeve 6 in its standby configuration in a first position, known as the injection position, these being in the form of two longitudinal bulges 8 formed on the internal surface 9 of the wall of the body 3 of the support sleeve 2 and of two first tabs 10 running axially in the proximal direction from the proximal end 11 of the protective sleeve 6. As a preference, the bulges 8 are diametrically opposed. Each bulge 8 comprises, at its proximal end, an internal retaining ramp 12 and each first tab 10 is equipped at its proximal end with a projection 13 the distal face of which is inclined and able to rest on the internal ramp 12 of the proximal end of the bulge 8 facing it. As will be explained later on, these first retaining means for retaining the protective sleeve 6 are able to be deactivated in order to cause the protective sleeve 6 to slide, in its retracted standby configuration, between a first position known as the injection position and a second position known as the end-of-injection position.

As shown in Figure 2, the device 1 also comprises second retaining means for holding the protective sleeve 6 in its standby configuration in a second position, known as the end-of-injection position, these being in the form of a transverse retaining surface 14 situated at the proximal end of each bulge 8, facing the internal ramp 12 of the said bulge 8 and of two second tabs 15 running in the proximal direction from the proximal end 11 of the protective sleeve 6 along an axis slightly inclined with respect to the longitudinal

axis of the injection apparatus 4, each second tab 15 being situated facing one said first tab 10, each second tab 15 being equipped at its proximal end with a hooked portion 16 the distal face 17 of which is able to rest on the transverse retaining surface 14 of the bulge 8 facing it. As will be explained later on, these second retaining means for retaining the protective sleeve 6 are able to be deactivated so as to allow the protective sleeve 6 to deploy at the end of injection.

As is apparent from Figures 1 to 3, the protective device 1 also comprises an intermediate collar 18 situated in the proximal end part 5 of the support sleeve 2. The proximal end part 5 of the support sleeve 2 comprises tabs 29, each tab 29 comprising a radial hooked portion 30 intended to retain the proximal face of the intermediate collar 18 in the proximal direction, the said radial hooked portion 30 comprising an internal ramp 31 the function of which will be explained later on. The intermediate collar 18 is able to slide with respect to the support sleeve 2 within the proximal end part 5 of this support sleeve 2. The intermediate collar 18 comprises collaboration means for collaborating with the piston head 19 of the injection apparatus 4. In the example depicted, these collaboration means are in the form of two diametrically opposed legs 20 running in the proximal direction, slightly offset from the body 21 of the collar 18 in the radial direction and connected to the proximal end of the collar 18 by radial bridges 22.

The intermediate collar 18 also comprises deactivation means for deactivating the first and second retaining means, these being in the form, in the example depicted, of a surface 23 projecting radially from the body 21 of the collar 18, this surface 23 being able to cooperate with the said first tabs 10 and the said second tabs 15 to deflect them circumferentially. In the example depicted, this surface 23 has an external

ramp 24 facing each first tab 10 and a longitudinal recess 25 facing each second tab 15.

The protective device 1 also comprises at least one pushing means in the form, in the example depicted, of a spring 26 the proximal end of which bears against the distal end 27 of the intermediate collar 18 and the distal end of which bears against an annular rim 28 formed on the internal surface of the protective sleeve 6 at its proximal end 11.

In practice, the protective device 1 according to the invention is in the storage position as depicted in figure 4. The protective sleeve 6 has been inserted within the support sleeve 2 until the respective distal faces of the projections 13 of the first tabs 10 come into contact with the respective internal retaining ramps 12 of the bulges 8. Because they are slightly inclined with respect to the longitudinal axis of the device 1, the distal faces 17 of the hooked portions 16 of the second tab 15 are not in contact with the transverse surfaces 14 of the bulges 8. Then the spring 26 is inserted, its distal end bearing against the annular rim 28 of the protective sleeve 6. The intermediate collar 18 is then inserted by pressing on the internal ramps 31 of the radial hooked portions 30 of the tabs 29 which deflect as the said collar 18 passes. In the storage position, the intermediate collar 18 is therefore clipped into the proximal end part 5 of the support sleeve 2 by means of the tabs 29 and is retained in the proximal direction by the radial hooked portion 30 of these tabs 29. The proximal end of the spring 26 bears on the distal end 27 of the intermediate collar 18. The system is thus perfectly locked, with no risk of activation of the protective sleeve being triggered. In this position, the injection apparatus 4, in the form of a syringe in the example depicted, is assembled as shown in Figure 5 and the product contained in the syringe can be injected.

At the end of injection, as shown in Figure 6, the piston head 19 of the injection apparatus 4 comes into contact with the collaboration means, that is to say with the legs 20 in the example depicted, of the intermediate collar 18. By continuing to exert pressure and to push on the piston head 19, the intermediate collar 18 is moved in the distal direction and the external ramps 24 of the radially projecting surface 23 of the body 21 of the collar 18 deflect the first tabs 10 circumferentially. At the same time, the hooked portions 16 of the second tabs 15 are guided into the longitudinal recesses 25 of the radially projecting surface 23 of the body 21 of the intermediate collar 18 and the second tabs 15 are thus deflected circumferentially to come back parallel to the bulges 8.

Thus, the first retaining means for holding the protective sleeve 6 in its retracted standby configuration in the first, injection, position are deactivated and, under the pressure of the spring 26, the protective sleeve 6 is moved in the distal direction, over a short distance, until the distal faces 17 of the hooked portions 16 of the second tabs 15, guided by the longitudinal recesses 25, come into contact with the transverse retaining surfaces 14 of the bulges 8, as shown in Figure 7. The protective sleeve 6 is then in its retracted standby configuration in the second, end-of-injection, position. In this position, the protective device 1 is immobilized. The piston is at the end of its travel and it is not possible to trigger activation of the protective sleeve 6 by continuing to push on the piston head 19.

To trigger activation of the protective sleeve, the user has to slightly release his pressure on the piston head 19. Thus, at this stage, the end-user may decide to activate the protective sleeve 6 while the needle 7

is still in the patient or may, on the other hand, decide to withdraw the needle 7 from the patient and then to activate the protective sleeve 6.

When the user slightly releases the pressure on the piston head 19, the intermediate collar 18 is moved in the proximal direction under the effect of the pushing of the spring 26. While this is happening, the surface 23 projecting radially from the body 21 of the collar 18 releases the second tabs 15 as shown in Figure 8. These second tabs 15 return to their initial position slightly inclined with respect to the longitudinal axis of the device 1 and the distal faces 17 of the hooked portions 16 no longer bear against the transverse retaining surfaces 14 of the bulges 8.

Under the effect of the pushing of the spring 26, the protective sleeve 6 is then moved in the distal direction and covers the needle 7 (in chain line) as shown in Figure 9.

It is evident from the foregoing that the invention provides decisive improvements to similar devices of the prior art by making it possible for the protective sleeve to be activated only at the end of injection and at the time when the end-user so decides.

It goes without saying that the invention is not restricted to the embodiment described hereinabove by way of example but that, on the contrary, it encompasses all alternative forms of embodiment that fall within the field of protection defined by the attached claims.